

## Regional Science Priority Needs

<u>REGION 1 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<b>1) The Impact of Residential and Commercial Land Use on New England's Water Quality *</b> <ul style="list-style-type: none"> <li>The 3<sup>rd</sup> version of CADDIS is planned for release in FY2010. The 3<sup>rd</sup> version of CADDIS will address additional stressors (e.g., habitat structure), different case studies (e.g., a western river), and new analytical tools (e.g., multivariate methods).</li> <li>Development of Automated Geospatial Watershed Assessment (AGWA) tool, an interface designed to run two watershed runoff and erosion models: the Kinematic Runoff and Erosion (KINEROS) model, and the Soil and Water Assessment Tool (SWAT).</li> <li>Developing landscape indicator tools to allow watershed managers to evaluate relative contribution of multiple stressors spatially and temporally across a watershed (ATtILA for ArcGIS).</li> </ul>	<p>Chuck Noss</p>  <p>NERL/ESD B. Kepner</p> <p>NERL/ESD B. Kepner</p>	<p>FY2010</p>  <p>FY2008</p> <p>FY2009</p>
<b>2) Diesel Retrofit Technology *</b> <ul style="list-style-type: none"> <li>NRMRL has and continues to verify the performance of technologies designed to reduce air emissions from diesel engines. These technologies are used to retrofit older and current model heavy-duty diesel trucks, buses, and non-road equipment. These technologies are verified by ETV Program's Air Pollution Control Technology (APCT) Center, operated by RTI International under a cooperative agreement with EPA.</li> </ul>	Dan Costa	
<b>3) Climate Change-Regional Green House Gas Control Strategy/Cause and Effect of Different Strategies *</b> <ul style="list-style-type: none"> <li>As part of the global change research program, ORD has worked jointly with OAR and Regional offices to identify policy questions and research priorities associated with how air quality management programs may have to adapt as the climate changes. A component of these efforts will look at how different GHG technologies and mitigation approaches will influence air quality.</li> </ul>	<p>Joel Scheraga</p> <p>Douglas McKinney</p>	September 30, 2008

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<u>REGION 1 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p>3) Climate Change-Regional Green House Gas Control Strategy/Cause and Effect of Different Strategies * (continued)</p> <ul style="list-style-type: none"> <li>The Global Program has completed its first major investment in the development of a regionally-focused decision support tool that can be used to evaluate alternative strategies for (1) adapting to a changing climate, (2) mitigating greenhouse gases, and (3) account for co-benefits of adaptation strategies that also result in reductions in greenhouse gas emissions. The tool is a first-of-a-kind, nine-region MARKAL model of the U.S. that can be employed by federal and regional decision makers to explore future scenarios of energy system development and associated emissions of pollutants (both criteria air pollutants and CO<sub>2</sub>). The peer-reviewed Regional MARKAL model will be released in 2008. (An earlier Region 1 MARKAL model was developed in partnership with the Northeast States for Coordinate Air Use Management [NЕСAUM] – the Clean Air Association of the Northeast States.)</li> <li>The Regional MARKAL model should help address some of the needs identified by Region 1. It can, for example, be used by the New England Governors/Canadian Premiers to evaluate alternative strategies for attaining the greenhouse gas targets they've set for the entire Northeast.</li> <li>This work will be reflected in the new Global MYP.</li> </ul>	<p>Joel Scheraga</p> <p>Douglas McKinney</p>	<p>September 30, 2008</p>

## Regional Science Priority Needs

<u>REGION 2 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p>4) <b>Nitrogen Indicator for Estuarine Systems</b></p> <ul style="list-style-type: none"> <li>Products and models that effectively quantify nutrient impairment of coastal/estuarine/watershed ecosystem responses and relate impairments to causes in order to support continual improvement of nutrient criteria and guide nutrient management in coupled watershed-estuarine-coastal ocean ecosystems.</li> </ul>	<p>Chuck Noss</p> <p>NHEERL</p>	
<p>5) <b>Eutrophication (biological/estuary indicators)</b></p> <ul style="list-style-type: none"> <li>Additional discussion between Region 2 and ORD is necessary to respond to this need.</li> </ul>	<p>Chuck Noss</p>	
<p>6) <b>New York Metro Climate Change Sensory Network *</b></p> <ul style="list-style-type: none"> <li>This proposed project falls outside the purview of ORD's Global Change Research Program, which is focused on assessing the potential impacts of climate change and evaluating alternative adaptation strategies. However, it does fall within the purview of the larger interagency U.S. Climate Change Science Program (CCSP). The CCSP is responsible for coordinating and integrating climate change research across 13 federal departments and agencies. Other CCSP member agencies – such as NOAA, NASA, and USGS – are responsible for engaging in the type of monitoring activity proposed by Region 2. (For example, NOAA's National Climatic Data Center regularly collects and analyzes climatic data at a regional and local level that could be incorporated into the type of network proposed by Region 2.)</li> <li>ORD proposes to work closely with Region 2 to identify and engage the specific CCSP agencies that have responsibility for collecting the type of data required for such a sensory network – and for designing a network that would address the specific needs of decision makers in the New York City Metropolitan Area. (It is critical that the decision makers' needs first be identified to ensure that (1) the right type of network is designed, and (2) the right data are collected by the network.)</li> </ul>	<p>Joel Scheraga</p> <p>Joel Scheraga</p>	<p>August 2008</p>

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<u>REGION 2 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>7) Innovative Technologies for Capping Contaminated Sediments *</b></p> <ul style="list-style-type: none"> <li>• Application of semi-permeable membrane devices (SPMDs) to monitor contaminant migration in dynamic stream environment</li> <li>• Case study of using SPMDs to evaluate impact of dredging</li> <li>• Case study of SPMDs to evaluate performance of sequestration</li> <li>• Report on AquaBlok cap after 3 years</li> <li>• Report on field study of sequestration cap</li> </ul> <p><b>Status of Capping Technologies:</b></p> <ul style="list-style-type: none"> <li>• <b>Bauxite Capping Studies:</b> Bauxite has been found to be capable of sequestering a broad variety of heavy metals, including Hg, As, Cr, Cd, Pb, Zn, and Ni. Due to its unique surface properties, bauxite is able to sequester both cationic and oxy-anionic forms of the metals through a combination of adsorption, absorption, ion exchange, and precipitation. Bauxite can be installed as a much thinner cap over the contaminated sediments, a critical parameter for remedy selection in navigable waters.</li> <li>• <b>Monitored Natural Remediation:</b> Field evaluations of the performance of monitored natural remediation (MNR) and both sand and innovative caps will continue, with the aim of quantifying contaminant transport mechanisms to facilitate the prediction of remedy performance. Innovation in capping, both amendments and construction techniques (e.g., mats), will continue to be investigated.</li> <li>• <b>Sand Capping Studies:</b> Boston Harbor/Eagle Harbor/Wyckoff Superfund Site. ORD is investigating the migration of contaminants through a sand cap and resuspension during cap placement to identify potential field methods for minimizing sediment resuspension during cap placement. The research indicated that resuspension can be minimized by using improved release techniques that result in fewer disturbances of the contaminated sediment.</li> </ul>	<p>Randy Wentzel</p> <p>NRMRL</p> <p>NRMRL</p> <p>NRMRL</p> <p>NRMRL</p> <p>NRMRL</p> <p>NRMRL/Dennis Timberlake</p>	<p>FY2008</p> <p>FY2009</p> <p>FY2010</p> <p>FY2008</p> <p>FY2009</p>

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<u>REGION 2 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p>7) Innovative Technologies for Capping Contaminated Sediments * (continued)</p> <ul style="list-style-type: none"> <li>• <b>Active Caps:</b> The results of the Anacostia River demonstration in Washington, DC, completed in September 2007, indicate that an "active" cap (AquaBlok technology) can be adequately placed over a contaminated sediment area, remain physically stable over time; effect ground water movement; and have limited impact on the re-establishment of flora and fauna. This information is useful to EPA's Superfund program since effectively capping a contaminated site is less expensive than dredging and off-site treatment, with less environmental disturbances. The demonstration also indicated that re-contamination of the cap surface will occur if the contamination sources are not controlled.</li> <li>• Innovation in capping, both amendments and construction techniques (e.g. mats), will continue to be investigated.</li> <li>• Passive samplers are useful for evaluating the effectiveness of caps and other sediments risk management remedies. The development and use of passive samplers in assessing the availability of contaminants will continue.</li> </ul>	Randy Wentzel	
<p>8) Developing an Emission Signature for Diesel Particulate Matter to Determine the Relative Contribution of Diesel PM to Monitored PM Levels *</p> <ul style="list-style-type: none"> <li>• On-going development of source apportionment markers.</li> <li>• On-going field study in Detroit near roadway.</li> <li>• On-going source apportionment studies (data analysis) in NY (NESCAUM), Pittsburgh.</li> <li>• On-going field studies in Dearborn, St Louis, Birmingham.</li> <li>• Planned source apportionment study associated with USEPA-FHWA study in Las Vegas, Detroit and Raleigh.</li> <li>• NRMRL is performing detailed chemical analyses of emissions from a variety of sources including diesel engines. The updated PM emissions profiles are used as input to source-receptor models for apportioning and ascribing ambient air pollution back to its source.</li> </ul> <p>NRMRL has conducted research in the PM emissions from heavy duty diesel trucks for a number of years. This research has now been directed toward the use of plume sampling to study the effects of cooling and dilution on the formation of volatile PM. Efforts have included the complete redesign and construction of a new on-road laboratory suitable for this type of research. Included in this work was a characterization of the exhaust plume via flow visualization, tracer gas measurements and computational fluid dynamics modeling as well as an evaluation of currently accepted methods used to measure the physical and chemical properties of diesel PM. This work has resulted in the production of an on-road research facility which represents the current state-of-the-art in the measurement of the fine PM from heavy duty diesel trucks.</p>	<p>Dan Costa</p>  <p>NERL NERL NERL NERL NERL</p>	

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<u>REGION 2 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>8) Developing an Emission Signature for Diesel Particulate Matter to Determine the Relative Contribution of Diesel PM to Monitored PM Levels * (continued)</b></p> <ul style="list-style-type: none"> <li>NRMRL used the Diesel Emission Aerosol Laboratory (DEAL) to measure fine PM emissions in the plume of APPCD's Class 8 tractor-trailer under steady-state, near-zero grade conditions. The testing included 15 ppm low-sulfur diesel fuel and a biodiesel fuel blend supplied by the Department of Energy's National Renewable Energy Laboratory (NREL). Pump diesel fuel was also evaluated.</li> <li>NRMRL, via a RARE project with Region 2, quantified and compared the PM and gaseous exhaust pollutants emitted from selected diesel school buses which were shut down and ultimately restarted and those which idled continuously. Fine particulate matter (PM), particulate polycyclic aromatic hydrocarbons (PAHs), carbon monoxide (CO), total hydrocarbons (THC), nitrogen oxides (NOx), and formaldehyde were measured from six diesel school buses w/ Caterpillar engines and catalytic mufflers.</li> <li>NRMRL has worked jointly with NERL and OAR to enhance a database known as SPECIATE which is a repository for emission profiles. The profiles are organized by source category and include the range of diesel sources. The profiles contain volatile organic compounds (VOC) and Particulate Matter (PM) species. The VOC species are grouped into reactivity classes to support ozone air quality modeling. The PM species contain information on size and composition and are used to support PM and visibility air quality modeling. The database has also supported air toxic assessments and is integral to source receptor modeling applications.</li> </ul>	<p>Dan Costa</p> <p>NRMRL</p> <p>NRMRL</p> <p>NRMRL</p>	
<p><b>9) Addressing Increased Exposure in the Aging Population due to Methyl Mercury Exposure *</b></p> <ul style="list-style-type: none"> <li>Two hypotheses offered may be testable with existing data (e.g. NHANES) or cohorts. Are methyl Hg levels in blood/hair associated with adult onset neurological effects and coronary heart disease (e.g. in Framingham Heart Study)? AND does the aging population (who may be more susceptible to the disease outcomes) consume more fish and thereby become exposed to more methyl Hg?</li> <li>The age/exposure relationship would need to be established first, and existing fish advisories considered. Are the existing advisories sufficient? This may be an important public health issue but is it within EPA's purview?</li> <li>See Global section</li> </ul>	<p>Sally Darney</p>	

## Regional Science Priority Needs

<u>REGION 3 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>10) Developed and Developing Lands-Science to Support Local Decisions, Global Consequences: EPA's Role in Maintaining Landscape Integrity *</b></p> <ul style="list-style-type: none"> <li>• CADDIS – The 3<sup>rd</sup> version of CADDIS will address additional stressors (e.g., habitat structure), different case studies (e.g., a western river), and new analytical tools (e.g., multivariate methods).</li> <li>• Much of the research in the ERP is directly or indirectly relevant to the first issue of improving our understanding of ecosystems to support local land decisions but not specifically in Region 3 and it has just begun. These areas include:               <ul style="list-style-type: none"> <li>○ Effective Decision Support, including valuation, education and outreach, human well-being, and decision support platforms</li> <li>○ Modeling, Monitoring, and Mapping of Ecological Services</li> <li>○ 4 place based studies to examine all of the above topics in Oregon, Florida, N and S Carolina, and the whole of the Midwest</li> </ul> </li> <li>• The Regional Vulnerability Project has also developed tools ready for use in decision making including considerable information from Region 3. They are also expanding these decision tools for other regions and conditions.</li> <li>• EMAP has continued to examine the relationship between water quality/condition and landscape characteristics.</li> <li>• NERL has some of the world's experts on landscape characterization and may also be able to answer questions and provide insights.</li> </ul>	<p>Rick Linthurst</p>      <p>Betsy Smith</p>  <p>Michael McDonald Dan Heggem</p>	<p>FY2010</p>
<p><b>11) Mining-Impact Assessment, Compensatory Mitigation, and Conductivity *</b></p> <ul style="list-style-type: none"> <li>• Not currently part of the Land Research Program</li> <li>• Land Research Program researchers provided extensive groundwater remediation consultative support in the cleanup of the East Helena Superfund site in Montana. Researchers performed a field evaluation of a Permeable Reactive Barrier (PRB) for in situ (at source) removal of arsenic from groundwater. The pilot-scale PRB was installed in June 2005 and has been monitored since then. Hydrogeological and geochemical studies were conducted to select an appropriate design configuration for the PRB and evaluate the performance of the PRB system.</li> <li>• ORD has worked toward prevention of acid mine drainage (AMD), to reduce exposure to metals and sulfate. This research is focused on providing more cost-effective techniques for treatment of AMD-contaminated ground water and surface water, as well as cost-effective risk management techniques for down gradient impacts. As an example, this work has resulted in the development of low cost passive biotreatment systems for remote locations.</li> </ul>	<p>Randy Wentzel</p>   <p>David Reisman, NRMRL</p>	

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<u>REGION 3 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<b>11) Mining-Impact Assessment, Compensatory Mitigation, and Conductivity * (continued)</b>  EPA successfully established a cooperative agreement with the primary responsible party to construct the PRB and test the technology. In addition, the Agency's regional office in Denver benefited from the technical expertise of scientists at the site. A plan has been developed to move forward with the remediation of a highly contaminated aquifer.	Randy Wentzel	
<b>12) Chesapeake Bay</b>  <ul style="list-style-type: none"> <li>Additional discussion between Region 2 and ORD is necessary to respond to this need.</li> </ul>	Chuck Noss	
<b>13) Manure/CAFOs</b>  <ul style="list-style-type: none"> <li>Comprehensive nutrient management plan effectiveness in controlling pollutant (nitrate, pathogens) release from CAFOs at a dairy lagoon application site.</li> <li>Evaluation of waterborne pathogens associated with a concentrated swine feed operation in North Carolina.</li> <li>Develop means to evaluate the effectiveness of best management practices (BMPS) on the fate and transport of microorganisms contained in animal wastes.</li> <li>Winter runoff of surface applied animal manure and process wastewater.</li> <li>Evaluation of an infiltration basin and constructed wetland for managing waterborne pathogens associated with a cattle feed operation in Iowa.</li> </ul>	Chuck Noss  NRMRL  NRMRL/LRPCD NRMRL/LRPCD  NRMRL/LRPCD NRMRL/LRPCD	
<b>14) Agricultural Issues</b>  <ul style="list-style-type: none"> <li>Further discussion with regional staff is needed to further refine response to this broad subject area</li> <li>Developing predictive tools for prioritization of regulatory data requirements for pesticides and other toxic substances</li> <li>Enhancing the interpretation of data submitted as part of the regulatory process (e.g., pesticides registration/reregistration) in order to improve human health and ecological risk assessments</li> <li>Producing tools to assess/predict the impact of drinking water treatment processes on pesticide transformation pathways.</li> </ul>	Elaine Francis	

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<u>REGION 3 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p>14) Agricultural Issues (continued)</p> <ul style="list-style-type: none"> <li>• Developing the scientific underpinnings necessary to transform ecological risk assessments to a more realistic, spatially-explicit probabilistic basis where effects on wildlife and non-target plants can be evaluated as to their impacts at the wildlife population and plant communities levels; regional urban/agricultural modeling needs being considered (Regions are part of current implementation planning process)</li> <li>• Providing the tools necessary for updating OPP requirements for submissions of registrations for products of biotechnology (plant incorporated protectants) and the scientific foundation to help interpret data submitted; this includes understanding/monitoring impact of biotech products on non-target species, characterizing gene transfer, determining factors that influence pesticide resistance in target insect species, developing methods for risk management, and developing methods to assess for the potential allergenicity of genetically modified crops</li> <li>• Working collaboratively across all of ORD's labs, with scientists from Regions 3 and 9, and with scientists through the STAR extramural program to determine environmental impact of hormones from CAFOs; research includes field and laboratory studies, development and optimization of suites of <i>in vitro</i> screening and analytical methods to identify and quantify compounds responsible for endocrine activity, the identification of ecologically-relevant biomarkers in aquatic species, characterization of environmental fate and transport of endocrine active agents in the environment, and evaluation of current risk management technologies and development of new mitigation tools .</li> </ul>	Elaine Francis	

## Regional Science Priority Needs

<u>REGION 4 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>15) Influence of Diet and Soil Mineralogy on Arsenic Bioavailability *</b></p> <ul style="list-style-type: none"> <li>• HHRP research on Arsenic BBDR models may be helpful in addressing this question, especially as these models are expanded to include children's exposure factors.</li> <li>• Under the Land Research Program, a final report on an improved in vitro method to measure arsenic bioavailability and new methods for arsenic speciation will be completed.</li> <li>• A collaboration between NHEERL and NERL is addressing concerns with site-specific arsenic bioavailability and bioaccessibility from different soils. It also is focusing on development of new arsenic speciation methods. By using an improved bioavailability estimate, it may be possible to substantially reduce the cost of remediation.</li> </ul> <p><b><u>Recently submitted publications:</u></b></p> <ul style="list-style-type: none"> <li>• Mineralogy and characterization of arsenic, iron, and lead in a mine waste derived fertilizer. A.G.B. Williams, K.G. Scheckel, T. Tolaymat, C.A. Impellitteri. 2006. Environ. Sci. Technol. 40: 4874-4879.</li> <li>• Arsenic speciation and desorption/dissolution in iron-based drinking water treatment media. C. A. Impellitteri and K. G. Scheckel. 2006. Chemosphere. 64: 875-880.</li> <li>• Bioaccessibility of Arsenic bound to Corundum Using a Simulated Gastrointestinal System. D.G. Beak, N.T. Basta, K.G. Scheckel, and S.J. Traina. 2006. Environ. Chem. 3(3). 208-214.</li> <li>• Speciation and localization of arsenic in white and brown rice grains. A.A. Meharg, P.N. Williams, K.G. Scheckel, E. Lombi, J. Feldmann, A.R., Y. Zhu, A. Gault, and R. Islam. 2008. Environ. Sci. Technol. In Press.</li> <li>• Speciation, Characterization and Mobility of As, Se and Hg in Flue Gas Desulphurization Residues. S.R. Al-Abed, G. Jegadeesan, K.G. Scheckel, and T. Tolaymat. 2008. Environ. Sci. Technol. In Press.</li> </ul>	<p>Sally Darney</p> <p>Randy Wentzel</p> <p>NHEERL/NERL Karen Bradham, NERL Kurt Scheckel, NRMRL</p>	<p>January 2008</p>

## Regional Science Priority Needs

<u>REGION 4 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<b>16) Watershed and Airshed Factors Affecting Mercury Methylation *</b> <ul style="list-style-type: none"> <li>The CMAQ model continues to develop links to airshed methylation of mercury. Russ Bullock would be the primary contact for this work.</li> <li>From a watershed perspective, the ERP is not conducting research specifically about mercury. However, work on mercury and watershed conditions can be gleaned from the EMAP data where methyl mercury was a variable measured in fish across much of the US. New findings in the relationship between mercury and selenium are forthcoming from work done in Corvallis.</li> </ul>	Rick Linthurst  Russ Bullock (NOAA, RTP) NHEERL/WED Spence Peterson	June/July 2008
<b>17) Life Cycle Construction Initiative *</b> <ul style="list-style-type: none"> <li>Have worked with Region 6 and Region 4, along with the Army Corps in examining reuse of construction materials from disaster debris.</li> </ul>	Randy Wentzel	
<b>18) Closed-Loop Manure Treatment/Energy Production Systems for Small- to Medium-Sized Animal Operations (Agriculture; CAFO) *</b> <ul style="list-style-type: none"> <li>ETV-ESTE Demonstration of Anaerobic Digestion of CAFO Manure</li> </ul>	Chuck Noss  NRMRL/LRPCD	
<b>19) Alternative Fuels/Clean Energy</b> <ul style="list-style-type: none"> <li>Testing air emissions associated with different blends of ethanol used by light duty vehicles in dynamometer facilities. This work will develop emission factors for the various blends under different operating conditions (e.g. temperature) which will support future assessments of the impacts of these fuels. Additional studies on emissions from biofuels are underway to examine potential health implications. The research will produce source profiles for various blends of fuels and identify any emission compounds of concern that may increase with the use of alternative fuels. This research will provide improved emission factors and models to conduct regulatory assessments, risk assessments, and develop SIPs.</li> <li>Comparing emissions from combustion of Fossil Distillate and Biodiesel Fuels in an industrial boiler. This work supports OAR decisions on permitting requests for use of green energy in existing facilities.</li> </ul>	Alan Hecht	

## Regional Science Priority Needs

<u>REGION 5 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p>20) Development of Health-Based Standard for Asbestos Concentrations in Air and Assistance to Region for Proposed Use of Taconite Tailings as Road Aggregate *</p> <ul style="list-style-type: none"> <li>• See ORD research on asbestos for potentially useful lessons learned on health effects of fibers based on size and type (e.g. Libby Montana project)</li> <li>• U. Minnesota fiber study.</li> </ul>	<p>Randy Wentzel</p> <p>NHEERL/ Linda Birnbaum</p> <p>NHEERL/ Phil Cook</p>	
<p>21) Nutrient Control with Better Understanding of Winter Runoff of Surface Applied Animal Manure (CAFO) *</p> <ul style="list-style-type: none"> <li>• NRMRL/LRPCD is working with Region 5 and USDA on winter runoff of surface applied animal manure and process wastewater.</li> </ul>	<p>Chuck Noss</p> <p>NRMRL/LRPCD</p>	

## Regional Science Priority Needs

<u>REGION 6 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>22) Development of an Alternative Asbestos Control Method (AACM) *</b></p> <ul style="list-style-type: none"> <li>• Further discussions with the regions on issues on Demolition #3 are needed.</li> <li>• NRMRL engineers worked with Region 6 engineers on demonstrating the new method. The method was tested (Demolition #1) at Ft. Chaffee, AR in April, 2006, by demolishing two virtually identical side-by-side buildings, one using the common NESHAP method and the other using the AACM. The AACM performed well, being as environmentally protective, but being faster and cheaper. A second demolition at Ft. Chaffee, using a two-story structure (Demolition #2), was completed in July, 2007.</li> <li>• The results of the first two demolitions were very promising, but further research is needed to prove the applicability of the AACM under a variety of conditions. The ultimate result could be millions of dollars of savings for cities and much faster action in removing old buildings so that other uses can be made of the land.</li> <li>• ORD will provide continued support to provide the science and data needed with demolition projects completed and scheduled. Demolitions #1 and #2 have been completed, with Demolition #3 being scheduled at a different site in Region 6. Discussions are underway on a fourth demolition would increase the types of asbestos listed in the amendment contemplated for NESHAP, allowing the AACM as a demolition procedure.</li> </ul>	<p>Randy Wentzel</p>  <p>Roger Wilmouth, NRMRL</p>	
<p><b>23) Ozone</b></p> <ul style="list-style-type: none"> <li>• NRMRL is currently conducting studies to improve estimates of biogenic volatile organic compounds (BVOC) from natural sources. The compounds emitted are precursors to both ozone and secondary PM formation. Ongoing research will improve estimates of BVOC with high aerosol yields. These results will be incorporated into emission algorithms that are used in models of PM and O<sub>3</sub> precursors.</li> <li>• NRMRL is developing open burning emission models to improve spatial and diurnal resolution of ozone precursor and PM emissions. The research will improve the accuracy of the fuel consumption estimates, incorporate functions which account for variability in emissions from ignition, flaming, and smoldering phases, and improve performance of the models for making estimates in the eastern U.S.</li> <li>• NERL continues to advance CMAQ for both ozone and secondary PM. New modules being tested after laboratory development for better estimation of ozone from biogenics and mobile source aromatics.</li> </ul>	<p>Dan Costa</p>  <p>NRMRL</p>  <p>NRMRL</p>  <p>NERL</p>	

## Regional Science Priority Needs

<u>REGION 6 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>24) Cumulative Risk Assessment</b></p> <ul style="list-style-type: none"> <li>OSP, the Tribal Science Council and NCEA are members of the Ponca Cumulative Risk Assessment Task Force and are moving ahead with the planning of the project.</li> </ul>	<p>Sally Darney</p>	
<p><b>25) Hurricane Debris</b></p> <ul style="list-style-type: none"> <li>ORD (NRMRL and NCEA) is working with Region 6 and Louisiana DEQ in evaluating alternative approaches to managing wastes from natural disasters. Field evaluations are being conducted this year in New Orleans to assess the use of shredders/grinders and air curtain destructors in managing construction and demolition wastes. These results will be used to provide the EPA, States and other Federal Agencies with additional options in managing these wastes.</li> <li>ORD has worked with Regions 4 and 6, OSWER, States, and other Federal Agencies in assessing waste management alternatives. This has included materials recycling and reuse, deconstruction, and rendering operations.</li> </ul>	<p>Randy Wentzel</p> <p>NRMRL/NCEA</p>	

## Regional Science Priority Needs

<u>REGION 7 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>26) Biofuels Impacts</b></p> <ul style="list-style-type: none"> <li>Enhancing the Market Allocation Model (MARKAL) to address system-wide regional implications of biofuels. The model currently contains a generic representation of biomass and biofuels resources that lacks detailed regional specificity, and does not include waste-to-energy technologies at any level of detail. This work will add an agricultural sector to the MARKAL model, provide regionalized supply curves for biomass and biofuel resources, and add/revise the necessary processing technologies (infrastructure representation). In addition, it will add a waste to energy component to the model.</li> <li>Assessing the composition and fate and transport of fuel spills from leaking underground storage tanks (UST) and have developed conceptual and predictive models to understand the behavior of ethanol plumes in the environment. EPA has conducted laboratory and field studies (including at Vandenberg Air Force Base), and has assessed the impact of ethanol mixtures on the behavior of conventional constituents in gasoline, such as benzene, toluene, and ortho-xylene and assessing effects of drinking water pump rates on plume migration.</li> </ul>	Alan Hecht	
<p><b>27) Lead Mine Tailings</b></p> <ul style="list-style-type: none"> <li>Not currently part of Land Research Program.</li> <li>Impact of a Barrier Compost Cap on Pb Speciation and Bioaccessibility in Wetland Impounded Mine Tailings. S. Brown, A.G.B. Williams, and K.G. Scheckel. 2008. Environ. Chem. In Review.</li> <li>Develop a passive treatment process to replace active treatment from a mine waste repository.</li> <li>Demonstrate the long-term performance of passive treatment of mine waste contaminants of surface water.</li> </ul>	<p>Randy Wentzel</p>    <p>NRMRL</p>    <p>NRMRL</p>	          <p>FY 2009</p>    <p>FY 2011</p>

## Regional Science Priority Needs

<u>REGION 7 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>28) Agriculture (CAFOs)</b></p> <ul style="list-style-type: none"> <li>• Bioinformatic approach to PPCP priority-setting.</li> <li>• Genomic and chemical indicators of exposures and effects from EDCs and PPCPs on aquatic life from sewage discharges and CAFOs.</li> <li>• Evaluation of waterborne pathogens associated with a concentrated swine feed operation in North Carolina.</li> <li>• Develop means to evaluate the effectiveness of best management practices (BMPS) on the fate and transport of microorganisms contained in animal wastes.</li> <li>• Winter runoff of surface applied animal manure and process wastewater.</li> <li>• Evaluation of an infiltration basin and constructed wetland for managing waterborne pathogens associated with a cattle feed operation in Iowa.</li> </ul>	<p>Chuck Noss</p> <p>NERL/EERD M. Kostich NERL/EERD J. Lazorchak</p> <p>NRMRL/LRPCD</p> <p>NRMRL/LRPCD</p> <p>NRMRL/LRPCD</p> <p>NRMRL/LRPCD</p>	



## Regional Science Priority Needs

<u>REGION 8 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<b>29) Permitting for Clean Energy in Region 8 *</b> <ul style="list-style-type: none"> <li>A discussion between Region 8 and ORD is needed to better understand this need.</li> </ul>	Alan Hecht	
<b>30) Assessment of Mercury in the Great Salt Lake Ecosystem *</b> <ul style="list-style-type: none"> <li>There is no current research in the ERP focusing on the Great Salt Lake or the mercury issues there. There is a large program developing in wetlands and Mary Kentula at the Corvallis laboratory would be the best contact to gain additional insight on this issue.</li> </ul>	Rick Linthurst  NHEERL/WED Mary Kentula	
<b>31) Asbestos (Libby Site) *</b> <b>Asbestos Health Effects Research</b> <ul style="list-style-type: none"> <li>Studies were initiated to assess the health effects of asbestos fibers to support the Libby, Montana risk assessment being conducted by EPA. An asbestos mine was operating in Libby, MT and the risk assessment is being conducted to assess the risk of asbestos fibers for clean-up activities.</li> <li>Asbestos research continues to answer key scientific questions about the health effects from environmental asbestos. A comparative study on at least two other site-specific asbestos-containing environmental samples to determine levels where effects occur is planned for 2008.</li> </ul> <p>Research will be performed in the following areas:</p> <ul style="list-style-type: none"> <li>Comparative in vitro dissolution of asbestos fiber-containing samples</li> <li>Comparative in vitro cellular toxicity</li> <li>Comparative in vivo toxicity of asbestos fiber-containing samples (delivered primarily by intratracheal instillation in rats and mice)</li> <li>Subchronic inhalation toxicology of the Libby material in rats</li> <li>Dosimetric modeling of the results from the <i>in vitro</i>, comparative toxicity, and inhalation toxicology studies to provide a more informed risk assessment of the Libby asbestos material.</li> </ul> <b>Asbestos Aerosolization Research</b> <ul style="list-style-type: none"> <li>Three field studies were conducted to evaluate aerosolization of asbestos fibers from soil surfaces and develop sampling methods for use by OSWER. There is a lack of data and appropriate methods to determine the degree of asbestos aerosolization. The research will develop sampling and measurement methods.</li> </ul> <p>The research program will improve the field detector and ORD will conduct additional studies in: Montana, Michigan, Washington, Oregon, and California. Indoor carpet sampling also will be conducted using another specifically designed test instrument.</p>	Randy Wentzel  NHEERL/ Linda Birnbaum	2008

## Regional Science Priority Needs

<u>REGION 9 PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<b>32) Response to Harmful Algal Blooms *</b> <ul style="list-style-type: none"> <li>• Reports from the FY2005 grants are expected in 2011.</li> <li>• Scientific Assessment of Harmful Algal Blooms.</li> <li>• Harmful Algal Bloom Management and Response: Assessment and Plan</li> <li>• Reports being finalized by Joint Subcommittee on Ocean Science and Technology</li> </ul>	Chuck Noss  NCER	2011
<b>33) Advanced Clean Air Technologies for Mobile Sources (workshop) *</b> <ul style="list-style-type: none"> <li>• NRMRL is working with Region 9 on this workshop and has identified potential areas for collaboration.</li> </ul>	Dan Costa  NRMRL	
<b>34) Formation of PM 2.5 *</b> <ul style="list-style-type: none"> <li>• Improved emissions and air quality models.</li> <li>• In-laboratory studies and computational chemistry on secondary organic formation of aromatics, NO3 from N2O5, biogenics (NERL)</li> <li>• NRMRL is working with the NERL and NASA to construct and evaluate a new multi-layer biochemical (MLBC) model of bi-directional NH3 exchange with vegetation. The MLBC model will eventually be incorporated into the Community Multi-Scale Air Quality Model, which is the Agency's primary regional modeling tool for regulatory applications. Flux data collected by NRMRL is being used to test the initial version of the MLBC model.</li> <li>• NRMRL is characterizing nitrogen emissions from fossil fuel and agricultural sources. Recent studies suggest that isotope chemistry is a useful method for tracking subsurface nitrogen movement from agricultural sources. Similar approaches may be used to assess the contribution of agricultural vs. fossil fuel nitrogen in PM2.5. The research underway is investigating the differences in concentrations of inorganic and total PM2.5 between agricultural and urban environments. During 2007, samples will be collected semi-continuously at an urban site (EPA/RTP campus) and an agricultural site with elevated atmospheric NH3 (Kenansville, NC). Ammonia gas and ammonium aerosol will be analyzed for N14/N15. This data will be used to further evaluate regional air quality models and to answer basic scientific questions regarding the atmospheric chemistry of NH3 and inorganic PM2.5 in agricultural vs. urban environments.</li> </ul>	Dan Costa  NERL  NERL/NRMRL  NRMRL	
<b>35) Advanced Technical Tools for Determining CWA Jurisdiction *</b> <ul style="list-style-type: none"> <li>• Headwaters/Wetlands identification/classification/connectivity.</li> </ul>	Chuck Noss  NERL/ESD NERL/ERD NERL/EERD	

### Regional Science Priority Needs

REGION 9 SCIENCE PRIORITY NEEDS	ORD CONTACTS	DELIVERABLE DATES
<p><b>36) Pyrethroids in Water and Sediment: Improving Assessment and Management Tools *</b></p> <ul style="list-style-type: none"> <li>SOPs for pyrethroids due FY 2009</li> <li>Collaborating with Regions to develop inventory of currently available pyrethroid sampling/analysis methods and generating consistent list for Regions to use for their contract labs</li> </ul>	Elaine Francis	2009
<p><b>37) Contaminated Vapor Intrusion into Buildings: Improving Methods for Site Investigation *</b></p> <ul style="list-style-type: none"> <li>Internal report on vapor intrusion method development for exterior monitoring.</li> <li>Journal article on vapor intrusion and engineering factors to determine approaches for remediation of gas stations and dry cleaners.</li> <li>In 2005, ORD began with an evaluation and review of the literature on vapor intrusion. A follow-up, updated publication is planned for journal publication in 2008. <ul style="list-style-type: none"> <li><i>Tillman, Fred D, and James W. Weaver, 2005, Review of Recent Research on Vapor Intrusion, U.S. Environmental Protection Agency, Washington DC, EPA/600/R-05/106.</i></li> </ul> </li> <li>As a consequence of the, then, prevalence of the Johnson and Ettinger model in vapor intrusion assessment, we undertook a more detailed evaluation of uncertainties associated with its results. We determined, when all parameters were considered simultaneously, that the uncertainties in the model results were greater than previously appreciated. From these analyses we developed a set of upper and lower-bound parameters for use in bounding vapor intrusion assessments. The purpose of this work was to establish sets of parameters that could be assured to generate best or worst case exposure assessments, given uncertainty in the parameter values. <ul style="list-style-type: none"> <li><i>Tillman, Fred D and James W. Weaver, 2006, Uncertainty from Synergistic Effects of Multiple Parameters in the Johnson and Ettinger (1991) Vapor Intrusion Model, Atmospheric Environment, 40(22) 4098-4112.</i></li> <li><i>Tillman, Fred D and James W. Weaver, 2007, Parameter Sets for Upper and Lower Bounds on Soil-to-Indoor-Air Contaminant Attenuation Predicted by the Johnson and Ettinger Vapor Intrusion Model, Atmospheric Environment, 41(27), pp 5797-5806.</i></li> </ul> </li> <li>Calculation tools were developed for use in assessing uncertainties in the Johnson-Ettinger model results and are posted on the EPA web site at <a href="http://www.epa.gov/athens/onsite">http://www.epa.gov/athens/onsite</a>. These calculators are being used by states and consultants for VI assessment. There is a publication on a version of these calculations: <ul style="list-style-type: none"> <li><i>TILLMAN, F. AND J. W. WEAVER. Johnson and Ettinger (1991) Vapor Intrusion Model With Sub-Slab Concentration. U.S. Environmental Protection Agency, Washington, DC, EPA/600/C-06/002,2005.</i></li> </ul> </li> </ul>	Randy Wentsel NRMRL NRMRL  Jim Weaver, NERL  Dom Ditoro, NRMRL	FY 2010 FY 2010

## Regional Science Priority Needs

<u>REGION 9 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>37) Contaminated Vapor Intrusion into Buildings: Improving Methods for Site Investigation *</b> (continued)</p> <ul style="list-style-type: none"> <li>Based on our modeling results and other information, we instrumented a building at our facility for measurement of soil moisture content and gas phase pressure. The experimental facility has been used to show the impacts of using various assumptions concerning the degree-of-dryness of soil beneath and outside existing buildings. The results showed that the moisture content beneath a newly constructed building situated on a heavy clay soil was unchanged after a year's worth of monitoring and that usage of a moisture content that represented conditions of outside the building footprint would cause vapor impacts to be over estimated. Data collection is continuing at this facility (see <a href="http://www.epa.gov/athens/research/regsupport/vi.html">http://www.epa.gov/athens/research/regsupport/vi.html</a>) <ul style="list-style-type: none"> <li><i>Tillman, Fred D and James W. Weaver, 2007, Temporal Moisture Content Variability Beneath and External to a Building and the Potential Effects on Vapor Intrusion Risk Assessment, The Science of the Total Environment, 379(1) 1-15.</i></li> </ul> </li> <li>The Land Research Program recently synthesized vapor intrusion research in the document entitled <i>Assessment of Vapor Intrusion in Homes Near the Raymark Superfund Site Using Basement and Sub-Slab Air Samples</i>. The method and associated quality control measures developed for sub-slab sampling are being used at EPA regional offices across the United States. Several states, including California and Colorado, have incorporated many of the report's recommendations into state guidance documents on vapor intrusion</li> </ul>		
<p><b>38) Biodiesel life-cycle analysis *</b></p> <ul style="list-style-type: none"> <li>This is an area where NRMRL expects to expand its research in the near future. NRMRL will work with OTAQ to determine what has already been done and move forward to address the highest priority gaps in the analyses.</li> </ul>	<p>Alan Hecht</p> <p>NRMRL</p>	

## Regional Science Priority Needs

<u>REGION 10 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>39) Children's Health in Alaska *</b></p> <ul style="list-style-type: none"> <li>Exposure models for children developed by NERL may be applicable in Alaska. Ongoing research will develop models for children in different age groups (e.g. toddlers vs school age). Methods developed for NCS (e.g. collection and storage of breast milk for analysis of contaminants) could be applied in new studies in Alaska. Funding would be needed.</li> <li>Lessons learned from EPA-NIEHS Children's Centers are also relevant to planning longitudinal studies in Alaskan children (see new report: <a href="http://www.epa.gov/ncer/decade_childrens_research">http://www.epa.gov/ncer/decade_childrens_research</a>)</li> <li>Researchers in Alaska could apply for NCER grant in upcoming RFA on exposure methods and indicators for children, and an Alaska-based project might be considered for a Cooperative agreement to involve ORD experts in children's exposures and health. It might be possible to leverage a study in Alaska with the NCS, but separate funding would be needed because Alaska is not one of the NCS sites.</li> </ul>	<p>Sally Darney</p> <p>NERL/Ross Highsmith</p>	
<p><b>40) Impact of Forest Fires</b></p> <ul style="list-style-type: none"> <li>There is currently no research in the Ecological Research Program specifically on the impact of forest fires. However, there is an interagency group within the Committee on the Environment and Natural Resources, Subcommittee on Ecological Systems that is paying particular attention to this topic from a multi-agency perspective. Charlene Spells in EPA, OAR would be the best contact for this topic. The last Agenda covered these Agencies with contacts.</li> <li>Discussion of Future Ecosystems Fire Science Research Priorities <ul style="list-style-type: none"> <li>Forest Service - Dave Cleaves</li> <li>USGS - Erik Berg and Bea Van Horne</li> <li>NASA - Bill Emanuel</li> <li>EPA - Charlene Spells (OAQPS), Chris Geron (ORD), Brian Gullet (ORD), Tom Pace (OAQPS)</li> </ul> </li> </ul>	<p>Rick Linthurst</p>	

## Regional Science Priority Needs

<u>REGION 10 SCIENCE PRIORITY NEEDS</u>	<u>ORD CONTACTS</u>	<u>DELIVERABLE DATES</u>
<p><b>41) Mercury Methylation</b></p> <ul style="list-style-type: none"> <li>The issue of mercury methylation is one that was identified as being important in the 2003 Multi-Year Plan for the Mercury Research Program. Unfortunately, given the very limited budget available for mercury research in ORD, it will be not be possible to address the mercury methylation problem identified by Region 10.</li> <li>The Mercury Research Program has had to narrow the focus of the program to the highest-priority research activity; specifically, the evaluation of the effectiveness of the Clean Air Mercury Rule (CAMR). Fate and transport research – particularly the “hot spots” issue and its implications for the effectiveness of the CAMR – is the key problem that the Mercury Program is addressing.</li> </ul>	<p>Joel Scheraga</p> <p>NERL/Matt Landis</p>	
<p><b>42) Storm Water</b></p> <ul style="list-style-type: none"> <li>Development of impervious surfaces estimators for local to regional scale assessments of watersheds and their landscape relationship to stream ecology.</li> <li>CADDIS</li> <li>NRMRL conducts research to support the NPDES Stormwater Programs as follows: <ul style="list-style-type: none"> <li>Updating and improving the capabilities of the Stormwater Management Model (SWMM)</li> <li>Aging Infrastructure research includes assessment and rehabilitation issues associated with storm water collection systems. Includes research on design and performance of green infrastructure systems.</li> <li>Research on design, implementation and performance monitoring for structural BMPs in general. Includes pilot scale “controlled conditions” evaluations and environmental technology verifications.</li> <li>Development/enhancement of models to optimize storm water management in urban watersheds.</li> <li>In-stream field studies to assess the effectiveness of management strategies.</li> </ul> </li> </ul> <p><i>Note: NRMRL conducts additional research on POTW blending operations, CSOs and SSOs, etc. that are outside the EPA definition of “NPDES Stormwater Management.” These deal with management of Wet Weather Flow, NPS control, in-stream restoration and related management topics.</i></p>	<p>Chuck Noss</p> <p>NERL/ESD T.Jarnigan</p>	